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THE FEASIBILITY OF A POWERED BALLOON AS A HIGH ALTITUDE PLATFORM
FOR INTELLIGENCE COLLECTION DEVICES

1. Introduction

For approximately ten years balloons made of plastic materials have been used as high altitude platforms for various instruments designed to collect data on cosmic rays, air sampling, meteorology, etc. They have also been used as a platform for intelligence collection devices. Since free balloons are completely dependent on winds aloft for speed and direction, target coverage is a function of accurate forecasting of high altitude winds. This function puts considerable strain on the state of the art of forecasting when long distances are involved. It is probably only natural that after the very high altitude free balloon became commonplace that the lack of directional control would lead to the consideration of applying power to the balloon. Obviously, a balloon that could be directed by a propulsive force would enjoy a huge advantage over the free balloon. Since power sources, gas bag shape and materials have certain definite limitations studies were made in an attempt to determine if off-the-shelf components would in fact deliver enough power at a high enough altitude to make a powered balloon feasible as a high altitude platform for intelligence collection. Two reports summarize most of this study work: #1, titled "Controllable Balloon Study" made by [redacted] and sponsored by the Navy, and #2 entitled "Final Report on a Meteorological Study" sponsored by TSS/ED. These two reports are referred to as "Ref 1" and "Ref 2" in this study. 25X1

2. In an attempt to outline the usefulness of a powered balloon as a high altitude platform for intelligence collection devices, the following general requirements were considered:

- (a) Range - Sufficient to reach denied target areas on overflights or sufficient areas of border coverage.
- (b) Payload - The load carrying ability must be sufficient to permit a wide range of collection devices to be utilized.
- (c) Directional Control - Control must be established either remotely or inertially and the aircraft must be unmanned.

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(d) Detection and Interception - The craft must have at least an excellent chance of avoiding detection and interception.

(e) An advantage over existing systems must exist.

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These considerations are somewhat interdependent but they are discussed generally and separately below.

Range

The range, speed, altitude, payload and high altitude winds are all interdependent and Ref. 1 summarizes them in detail. To point up one specific instance, a balloon of high strength to weight plastic material can be aerodynamically shaped, internally pressurized, battery powered, propeller driven and inertially guided. Carrying a payload of 400 pounds to 70,000 feet it could maintain a speed of 20 knots for 900 nautical miles. Higher speeds reduce the distance, for example, it could maintain 50 knots for only 100 miles. This speed should be used as a vector that could be applied as wind drift correction to any target. Ref. 1 attempted to define the probability of reaching Kzyl-Orda, USSR from available launch areas on eight hour notice using both free and powered balloons. The probability of a free balloon in the spring is as high as 17%, the probability of a powered balloon is higher than 80% the year around. These figures are based on launching from [] to get to radio line of sight of the target on a one way mission. (See Figure 3-17, page 3-31, Ref. 1 for details). The distance the vehicle can travel is really determined by upper winds since the speed capability will not allow significant trajectories against the wind. For penetration overflights, multi-level trajectories may be utilized to enhance recovery of the equipment. In areas where upper air flow directions are favorable, tremendous ranges are possible. During the spring of the year powered flights from Alaska to Japan bending over or near Eastern Siberia should be frequently possible. Flying between the Arabian Sea and the Mediterranean with trajectories over the USSR border should be feasible.

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Payload

The load carrying ability directly affects the altitude speed and range. Payloads up to 1000 pounds are considered feasible (for details see page 4-66 to 4-71, Ref. 1).

Directional Control

Inertial guidance with programmed trajectories would allow unmanned directed flight. Favorable winds would establish the basic direction of flight and power used to insure target coverage.

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CONFIDENTIALDetection and Interception

[REDACTED] Generally a vehicle such as this could be made to be a difficult radar target. Shielding could be applied that could not be to heavier-than-air craft. As discussed below in "limitations" this vehicle will never be able to outrun or outclimb intercepting missiles or planes once their capability extends to around 100,000 feet. While the speed and ceiling altitude of the powered balloon remain essentially fixed the science of detection and interception is rapidly expanding. It is considered likely that by the time this vehicle could be developed the interception capability would allow shooting it down if detected. Shielding methods and techniques are readily applied to this type aircraft and it may be a very difficult detection target.

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Advantages over existing methods

A powered balloon has one unique advantage over other types of powered craft; it does not have to use power to stay aloft. This allows an operating altitude higher than any other present means and duration aloft longer than any now available or foreseeable. A powered balloon can fly at 100,000 feet, and stay aloft for days. At this altitude radio line of sight to the horizon is increased by about 150 miles beyond that of aircraft flying at 40,000 feet. It is believed that this 150 miles would be of importance in ferret type operations. The powered balloon is considered to be the only possible type vehicle capable of unmanned directed flight at extreme altitudes with a duration aloft measured in days.

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Limitations

The limitations of the powered balloon are discussed in an effort to promote a clear understanding of its capabilities. The most serious limitation is related to one of its big advantages; its operational altitude. While this altitude is high by present standards very little can be done

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about increasing it since even with ever lighter payloads and system weights the density of helium (or hydrogen) establishes the ceiling within a few thousand feet. Weather dependency presents the almost certainty that sooner or later one will "run out of gas" and be lost inside the target country. Speed and duration of powered flight using off-the-shelf components do not allow trajectories against the wind.

Possible Applications

(a) A powered balloon with characteristics described herein can fly close to the border of the USSR over the Caspian Sea area and carry infrared or radar devices that would allow substantially longer coverage of USSR missile launchings.

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Summary and Conclusions

The mechanics of a powered balloon have been calculated in detail and from the estimated performance using off-the-shelf components, it is believed that this type vehicle is a feasible high altitude platform for intelligence collection devices. The vehicle would operate within limitations and it would be weather dependent. Its susceptibility to interception is not expected to become more favorable with time but using shielding techniques it may escape detection. By any standards the powered balloon offers the potential for over the border surveillance at altitudes and for durations not otherwise possible now or immediately foreseeable. The potential also exists for unmanned, directed overflights to targets not reachable by other type aircraft at altitudes believed to defy present means of interception.

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